

$$\begin{array}{c}
 \text{NH}_2\text{---PEG---NH}_2 + \text{HOOC---CH}_2\text{---}\underset{\text{NH}}{\overset{|}{\text{CH}}}\text{---COOH} \\
 \qquad \qquad \qquad | \\
 \qquad \qquad \qquad \text{Boc} \\
 \downarrow \text{DIPC/DMAP/PTSA} \\
 \left( \text{NH---PEG---NH---C(=O)---}\underset{\text{NH}}{\overset{|}{\text{CH}}}\text{---CH}_2\text{---C(=O)} \right)_n \\
 \qquad \qquad \qquad | \\
 \qquad \qquad \qquad \text{Boc} \\
 \downarrow \text{TFA} \\
 \left( \text{NH---PEG---NH---C(=O)---}\underset{\text{NH}_2}{\overset{|}{\text{CH}}}\text{---CH}_2\text{---C(=O)} \right)_n
 \end{array}$$

Figure 1. Synthetic scheme of poly(ethylene glycol) derived copolymer with multiple amino groups for peptide attachment.

$$\begin{array}{c}
 \text{NH}_2 - \text{PEG}_{3400} - \text{NH}_2 + \text{HOOC} - \text{CH}_2 - \underset{\substack{| \\ \text{NH} \\ | \\ \text{Boc}}}{\text{CH}} - \text{COOH} \\
 \downarrow \text{DIPC/DMAP/PTSA} \\
 \left( \text{NH} - \text{PEG}_{3400} - \text{NH} - \overset{\text{O}}{\parallel}\text{C} - \underset{\substack{| \\ \text{NH} \\ | \\ \text{Boc}}}{\text{CH}} - \text{CH}_2 - \overset{\text{O}}{\parallel}\text{C} \right)_n \\
 \downarrow \text{TFA} \\
 \left( \text{NH} - \text{PEG}_{3400} - \text{NH} - \overset{\text{O}}{\parallel}\text{C} - \underset{\text{NH}_2}{\text{CH}} - \text{CH}_2 - \overset{\text{O}}{\parallel}\text{C} \right)_n \\
 \downarrow \begin{array}{l} \text{1} \\ \text{2} \\ \text{3} \end{array} \\
 \begin{array}{l}
 \text{Structure 1: } \text{N-((5-(2,4-dioxo-1,2,3,4-tetrahydro-1H-thiazolo[5,4-d]imidazol-5-yl)pentanoyl)oxycarbonyl)-pyrrolidine-2,5-dione} \\
 \text{Structure 2: } \text{CH}_2=\text{CH}-\text{S}(=\text{O})_2-\text{PEG}_{2000}-\text{C}(=\text{O})-\text{O}-\text{N-pyrrolidine-2,5-dione} \\
 \text{Structure 3: } \text{H-S-Peptide}
 \end{array} \\
 \downarrow \\
 \left( \text{NH} - \text{PEG}_{3400} - \text{NH} - \overset{\text{O}}{\parallel}\text{C} - \underset{\substack{| \\ \text{NH} \\ | \\ \text{C=O} \\ | \\ (\text{CH}_2)_5 \\ | \\ \text{NH} \\ | \\ \text{C=O} \\ | \\ (\text{CH}_2)_4 \\ | \\ \text{Thiazolidine ring}}}{\text{CH}} - \text{CH}_2 - \overset{\text{O}}{\parallel}\text{C} \right)_{0.1n} \left( \text{NH} - \text{PEG}_{3400} - \text{NH} - \overset{\text{O}}{\parallel}\text{C} - \underset{\substack{| \\ \text{NH} \\ | \\ \text{C=O} \\ | \\ \text{PEG}_{2000} \\ | \\ \text{S(=O)}_2 \\ | \\ \text{CH}_2 \\ | \\ \text{CH}_2 \\ | \\ \text{S} \\ | \\ \text{Peptide}}}{\text{CH}} - \text{CH}_2 - \overset{\text{O}}{\parallel}\text{C} \right)_{0.9n}
 \end{array}$$

Figure 2. Synthetic scheme of PEG-peptide conjugates containing multiple copies of peptides and reporter molecules

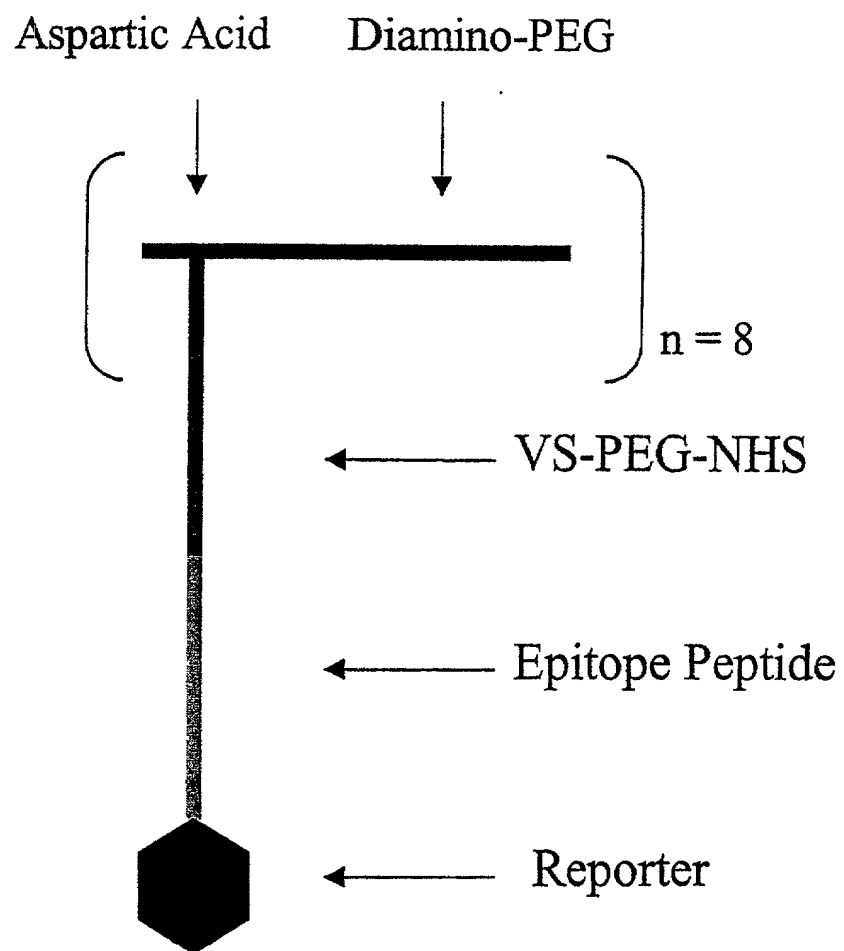
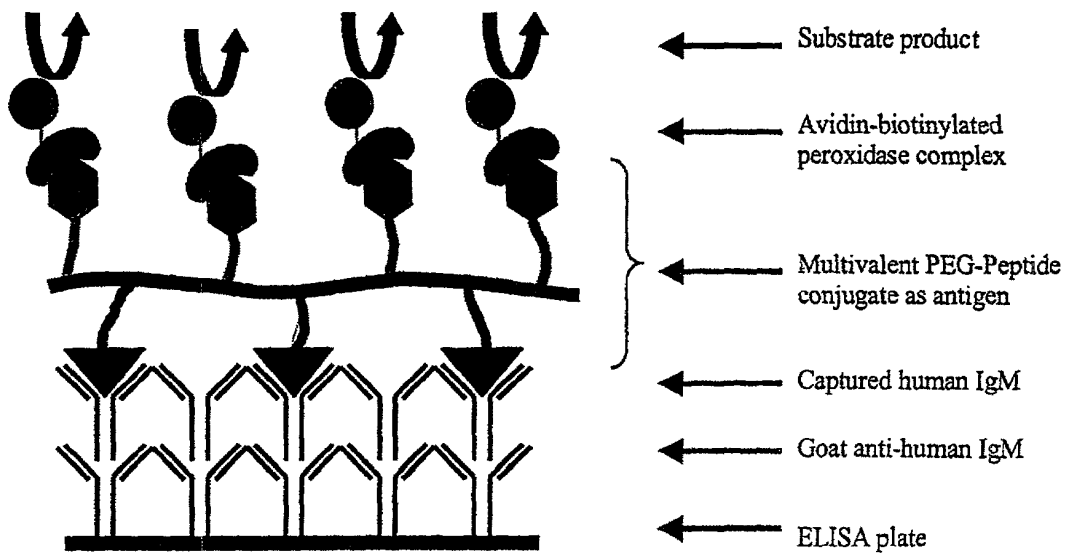


Figure 3. Schematic description of PEG-peptide conjugates with reporter group on the N-terminus of the peptide



 Biotin Reporter Molecules
  Epitope Peptides
  Polymer Chain

Figure 4. IgM-capture ELISA using PEG-peptide conjugate as antigen for serological diagnosis of Lyme disease